

61713 Jan. 1904

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The Powers Regulator Co.



MANUFACTURERS OF
AUTOMATIC TEMPERATURE CONTROLLING APPARATUS
CHICAGO · NEW YORK ·



THE POWERS SYSTEMS OF AUTOMATIC TEMPERATURE CONTROL

RELIABLE APPLIANCES FOR THE
AUTOMATIC REGULATION
OF HEATING APPARATUS

PATENTED: UNITED STATES, CANADA, ENGLAND, FRANCE, GERMANY

1904

MANUFACTURED BY

THE POWERS REGULATOR COMPANY

40 DEARBORN STREET : CHICAGO

111 Fifth Avenue, New York

922 Real Estate Trust Building, Philadelphia

732 Dorchester Street, Montreal

AUTOMATIC TEMPERATURE REGULATION

THE automatic control of artificial temperatures is a comparatively new art in the world of manufacturing and contracting. With the crude methods of heating employed by our ancestors, nothing of the kind was possible, and even with the advent of the more modern furnaces and steam systems, the operators were for years forced to be content with such regulation of temperature as could be obtained by manually operating heater drafts, ventilators, etc. As heating appliances approach perfection, however, and the knowledge of hygiene becomes more widely disseminated, the question of temperature in our living and working rooms has gradually assumed the importance that it deserves, and to meet the demand for means of automatically controlling these temperatures, various appliances have been placed before the public from time to time. It is a matter of curious interest that the problem has proven so difficult that, out of the many appliances introduced for the purpose, very few indeed have proven practicable, and out of the many hundreds of patents that have been issued for automatic temperature controlling apparatus, only a comparatively limited number are required to cover the appliances that are in successful use today.

Our experience in this field extends over many years, and it has been our constant endeavor to construct an apparatus which, though extremely sensitive and efficient in its workings, should be of such simple and substantial construction as would insure its durability under all conditions. That we have succeeded in this undertaking is evidenced by our constantly increasing business and the results that are being attained in buildings of all descriptions throughout the country. If the reader will look over the photographic reproductions shown in this book, he cannot but be impressed with the extent and character of the buildings which we are equipping with our appliances, the cost of the heat regulation amounting in many cases to thousands of dollars.

When investing large sums of money in an apparatus of this kind, it is well to give serious consideration to the financial worth and standing of the company that offers it. Has the company such an organization as will insure the apparatus getting proper attention during the coming years? With our organization of trained mechanics, installing work all over the country, we are always prepared to give immediate attention to any of our installations that may require it. With a well equipped factory, and branch offices carrying stock in the leading cities of the country, we are prepared to make prompt delivery and in every way give the best attention to the contracts that are entrusted to us.

EDUCATIONAL INSTITUTIONS

The importance of a uniform temperature for school rooms can hardly be overestimated; no teacher or pupil can do good work in an irregularly heated room, and the foundation for permanent ill health has often been laid in a cold taken during childhood in the school room from a quickly changing temperature, usually occasioned by opening windows to cool off when overheated.

Where the control of the temperature is left to the teacher, uniformity cannot be expected. When busily occupied with a class, the extremes only force themselves on the notice, and the result is a constantly changing temperature—first too warm and then too cold.

Again, it is well known that the teachers' feelings are but a poor index of what the temperature actually is, they are affected by their mental and physical condition so that, nervous and perhaps excited over the trials incident to their work, they often imagine the room overheated when it is not; and the knowledge of the fact that the temperature is variable contributes to these errors of imagination.

Where the temperature is controlled by an Automatic Regulator it becomes a settled fact in the mind of the teacher that the temperature is fixed, and much of the nervous and imaginary trouble is avoided, and more and better work can be done. In school rooms, crowded as they usually are, the teachers have enough to do without watching and attempting to control the temperature. They should be relieved of this care, and at the same time insured uniformity with plenty of pure air.

This work should be done by an Automatic Regulator, and as these appliances, as now made by us, have reached such a degree of perfection as to insure definite results, there should be no hesitation in adopting them wherever needed.

An Automatic System of Regulation, properly constructed, in connection with a well designed heating plant, will never fail to give complete satisfaction, and in large buildings it is a necessity if anything like uniformity of temperature is expected. The "Automatic" never forgets nor neglects its work. It is always on duty and the result is perfect regulation and a great saving of fuel.

It is equally important in office and apartment buildings, hotels, schools and in the home. Two results are secured—first, comfort and health for the occupants;—second, economy in fuel.

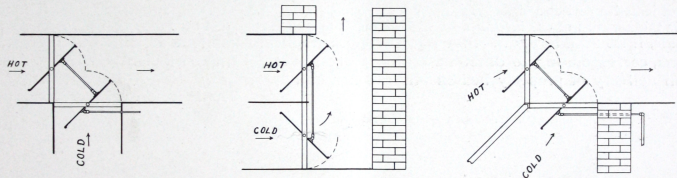
An office or apartment building is an investment which is calculated to pay its owner a certain rate of interest, and anything that goes into such a building and earns a fair rate of interest upon its cost, adds to the desirability of the entire investment. It is an impossibility for an engineer to so govern his heating apparatus as to give sufficient heat to every tenant in the building without overheating a great many rooms. A system of regulation applied to all of the rooms makes it certain that none of them will be overheated, and therefore no more fuel will be used than is absolutely necessary to properly warm the structure. The resultant saving will be from 15 to 20 per cent, and in some cases more. It is evident that this is no inconsiderable item in the expense of running a large building through the heating season.

These facts have become so generally recognized that progressive architects are specifying temperature regulation in a great majority of our modern buildings.

The Powers Regulator Company

The Powers System of Temperature Regulation for the Fan Systems of Heating and Ventilation

In the next following pages we show the Powers System of Temperature Regulation in its application to hot blast heating work. In this system of heating the ducts which bring the fresh air from out of doors are usually divided into pairs, one division carrying heated air and the other cold or tempered air. Dampers are placed in these ducts, and so handled by our apparatus as to mix the currents of hot and cold air, bringing them into the rooms at a temperature suitable for maintaining the desired degree of heat.



The above cuts show different arrangements of these ducts and the dampers which control the mixing of the air currents, the lower duct in each case carrying the cold air, and the upper warm air; the two currents mixing in the proper proportions beyond the dampers. The best results are unquestionably secured by the regulating apparatus that will operate these dampers in such a way as to secure a steady flow of properly heated air into the rooms.

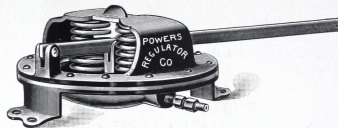
The dampers should not alternate in their position, but when the room temperature has reached the desired point should be *automatically held in such a position as will mix the hot and cold air currents*, bringing them into the rooms in

the proportions required to *maintain* the desired temperature. It is obvious that any regulating system that alternately opens and closes these dampers with no intermediate position will deliver the air into the rooms in a succession of hot and cold blasts, a condition of things by no means adapted to the comfort and health of the occupants.

We are the inventors of the method by which mixing dampers in the Fan Heating Systems are operated with a graduated motion.

Vigorous opposition and condemnation of this principle on the part of our competitors have given way, in response to the demand of the public, to final acquiescence in the method, and this has resulted in the bringing out by them of a series of imitative devices designed to accomplish the same purpose. While we fully appreciate the forced compliment implied in this imitation of our invention, we wish the public to keep in mind that the Powers System, as the "original" in this field, is the **standard, and that no other will maintain dampers in different intermediate positions, corresponding to different temperatures, over a range sufficiently wide to insure a uniform delivery of properly heated air into a room.**

The Powers Regulator Company.



Diaphragm Motor

We show here the thermostat with and without its cover, and the diaphragm motor used with the Fan System of heating. The thermostat is located in the room to be controlled. It operates on the vapor principle (p. 16) peculiar to all of our apparatus, and controls the passage of a supply of compressed air to the diaphragm motor, the latter being in proximity to and connected with the dampers which are to be operated. The compressed air is obtained by means of a suitable compressor, which may be steam, electric or hydraulic, and is usually located in the basement, a storage tank or reservoir being provided, and a constant pressure of fifteen pounds being automatically maintained therein. The pump is governed automatically and runs only when necessary to maintain the desired pressure. The building is piped in such a manner as to bring the air to each thermostat, and a single tube is run from the thermostat to the motor which is to operate the dampers. The air piping is of galvanized iron, and, in the extensions, of armored lead tubing, the armoring consisting of galvanized steel wire closely wrapped about the lead pipe and inclosing longitudinal wires, making a very strong and durable tubing. The operation is as follows: Supposing the thermostat to be set for 70 degrees temperature,

and that temperature to exist in the room, the thermostat will have allowed a certain quantity of air to pass into the diaphragm motor and under such a pressure as will bring the dampers into a position that will admit a mixture of the hot and cold air from the plenum chamber in such a proportion as will maintain this temperature of 70 degrees in the room. If now, through a change in the weather conditions, or from some other cause, the temperature in the room should rise a degree, the thermostat will respond immediately to this change of temperature and will cause a corresponding increase of air pressure in the motor. This results in a movement of the dampers tending to change the proportions of hot and cold air, decreasing the former and increasing the latter, this being done to just such an extent as will counteract the upward tendency of the room temperature. The desired temperature then being restored, the dampers come to a balance in such a position as will maintain it. Should the temperature fall in the room where the thermostat is located, the operation is precisely the same, though in a reversed manner, the springs in the diaphragm exerting a force to bring the dampers back to the position due to the lowered temperature.

With the Powers System of Regulation the dampers TAKE and MAINTAIN intermediate or mixing positions corresponding to the temperature requirement of the rooms, and in that way the alternating blasts of hot and cold air, so objectionable in all other systems, are avoided.

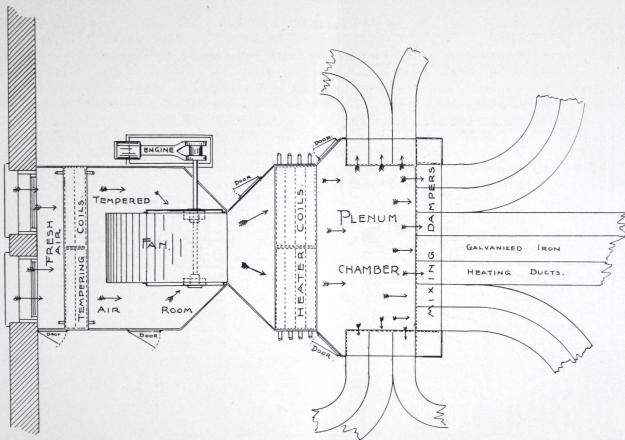


Plate 1. Plan View Steam Fan System of Heating

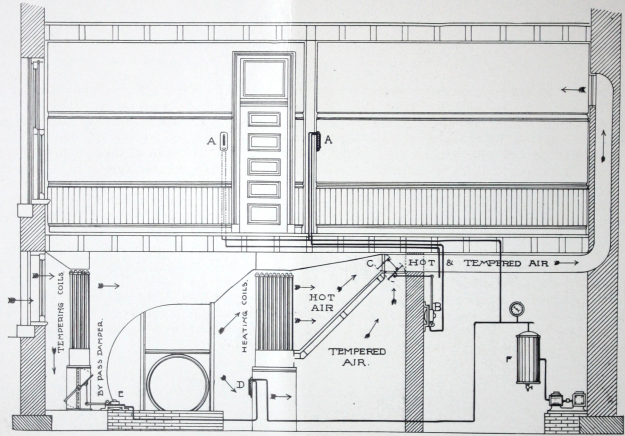


Plate 2. Elevation Steam Fan System of Heating

PLATES 1 and 2 are plan and elevation views showing the type of the Steam Fan System of heating commonly used in school houses. Plate 2 shows particularly the application of the automatic temperature controlling system.

"A" is the thermostat which controls the compressed air generated at "F" and operating the diaphragm motor "B," this being connected to the mixing dampers "C," holds them in such a position as will properly mix the hot and tempered air *before* it enters the room. It will be noted in this plan that the cold air from out of doors is first drawn through tempering or preheating coils and by them warmed to a temperature not higher than 60 degrees, the thermostat "D" in tempered air chamber operating the by-pass dampers beneath tempering coil so as to prevent the overheating of this air.

Very frequently an arrangement is used which dispenses with this preheating coil, dampers being placed in the platform between hot and tempered air chambers and thermostatically operated so as to direct a certain proportion of the heated air through the platform into the tempered air chamber, where a temperature of 60 degrees is maintained.

The arrangement of the thermostat, diaphragm and mixing dampers is repeated for as many rooms as there are under control, each room having its own thermostat, mixing dampers and heating duct, the compressed air from the reservoir "F" being supplied to all thermostats through a suitable arrangement of piping.

It is obvious that heating systems may differ very much in their construction. The heating surface, for instance, may be divided and heating coils located at the base of each flue. The automatic regulation may be applied to any of the various heating systems in use, the only requirement being an arrangement that will permit the placing of dampers or valves so that they will control individually the heat supply of the rooms.

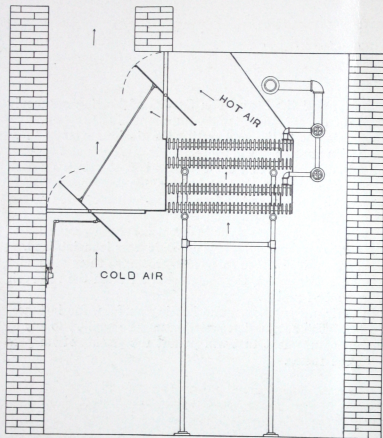


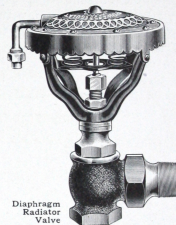
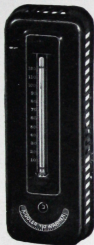
Plate 3. Gravity Indirect Heating System

PLATE 3 shows an arrangement of dampers commonly used in what is called the Indirect Gravity System of Heating.

Each room has an independent heat flue, and at the base of this flue is a stack of indirect radiation. This radiation is so enclosed in sheet iron that the cold air must pass either through it or around it, as the regulating dampers may determine. These dampers are controlled by the thermostat in the room above. In the drawing they are shown in an intermediate position, allowing a mixture of hot and cold air to pass up the flue. The dampers swing over the course shown by the dotted lines and are connected together so that one must close as the other opens; they are actuated by the diaphragm motor mounted on the wall of the cold air chamber.

The arrangement of thermostats, air tubing, etc., is the same as heretofore described.

The Powers System of Temperature Regulation as Applied to the Control of Direct Radiation



Diaphragm
Radiator
Valve

The automatic control of steam and hot water radiation is everywhere being recognized as a valuable feature in the equipment of modern buildings. If sufficient radiation is used to insure heating in the coldest weather, it will prove to be in excess of the requirements for the greater part of the heating season, thus necessitating a constant manipulation of the radiator valves to prevent overheating.

A good system of automatic regulation will control these valves so accurately and positively as to relieve the occupant of the room from any attention to the radiators or any thought as to temperature conditions. As an investment calculated to pay a high rate of interest on its cost this system is most desirable in any building.

We show above, cuts of the two principal parts of the Powers apparatus, the thermostat and valve, the former with and without its cover. The thermostat cover is handsomely plated and provided with a reliable thermometer, and a

means of adjusting to secure the desired temperature. This adjustment is made with a key, and can only be changed by the person having the key.

The valves are made in all standard sizes and patterns, either plain or nickel plated, with plain or ornamental diaphragms of suitable finish. Special plating of both valve and thermostat can be furnished when desired.

Air under a pressure of fifteen pounds is used to operate the system. This air is pumped into a reservoir by a suitable air compressor, and from there distributed to the thermostats in the building through a system of piping; a tube also leading from each thermostat to the radiator valve which is to be controlled.

When two or more valves are to be operated by one thermostat, the tubing is branched so as to supply air to the diaphragm of each valve.

The thermostats are operated on the well-known vapor principle peculiar to all of our temperature regulators. Within the thermostat is an air valve adapted to be opened or closed with the temperature variations and controlling the passage of air to the radiator valves. By a simple mechanism a positive operation of the radiator valve is secured, it being at all times either entirely open or firmly closed. This is necessary in the control of steam in order that no water may accumulate in the radiators. (If the heating system used be hot water, this feature is dispensed with and the valves are operated with a graduated movement, this being best adapted to the control of hot water circulation.)

PLATE 4, following page, shows the arrangement of thermostat, diaphragm valves and air piping used for the control of direct radiation—"A" being the thermostat, "B," "C" and "D" radiator valves under its control. The radiator shown in the center being on a *two-pipe* steam system, requires two diaphragm valves, one on the supply and one on the return. The other radiator is shown as connected to a *one-pipe* system. Such a system requires one valve only for each radiator, the steam entering the radiator and the condensation returning through this valve.

A number of radiators may be placed under the control of one thermostat, and all of the valves will be operated simultaneously; each room, however, must be supplied with a thermostat.

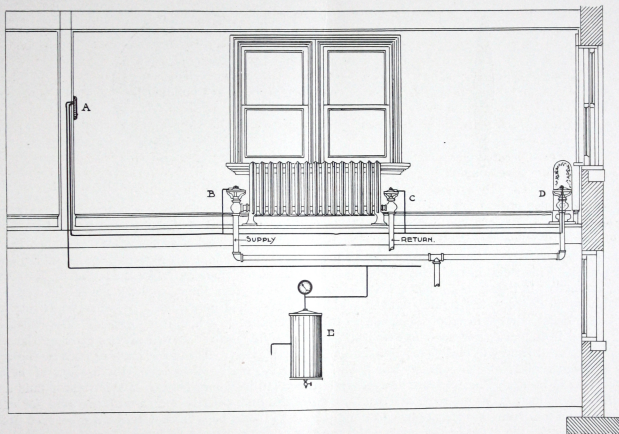


Plate 4. Direct Steam Control



The Thermostatic Disc

The thermostatic disc is the basis of all the apparatus used in the Powers Systems of Automatic Temperature Control. This disc, as will be seen by reference to the above illustrations, is composed of two circular plates of metal; these plates being spun in corrugations to give flexibility, the edges being united and sealed so as to form a hollow disc. In this disc is confined a certain quantity of volatile fluid whose boiling point is at a temperature somewhat below the operating point of the thermostat. This fluid has a fixed boiling point which never changes. The fluid used in the thermostats for control of temperatures in living rooms has a boiling point of 50 degrees Fahr., and whenever the disc is exposed to a temperature above 50 degrees, the liquid confined within vaporizes and generates a pressure which expands the disc, increasing its thickness, always in true proportion to the temperature to which it is exposed. The volatile fluid, being hermetically sealed in this disc, *will never lose its power or change in quality*. It will always produce the same pressure at any given temperature and will always expand the disc proportionately. The disc is made of such strength as will admit of exposure to a temperature of 120 degrees, this being, of course, greatly in excess of the amount of heat that would ever be applied to it in use. The pressure derived from the volatilization or boiling of this volatile fluid amounts to six pounds to the square inch at 70 degrees, and there is a definite and positive increase of pressure for each additional degree or fraction of a degree of heat applied to the disc. It will thus be seen that the power secured from this disc is ample to operate *directly* the valves which control the passage of the compressed air, and for this reason we do not find it necessary to use power multiplying devices, which add so much to the complication of other thermostats on the market.

SIMPLICITY
EFFECTIVENESS
AND PERMANENCY
ARE THE
MARKED CHARACTERISTICS
OF OUR APPARATUS



No electricity is used and we have dispensed with all the complicated mechanism which has heretofore been found necessary to the automatic control of temperature. There are but few working parts in the thermostat and they are so simple in construction and positive in operation that the liability to derangement is reduced to a minimum. *There are no restricted air passages requiring fine adjustment*, with consequent liability of stoppage from dirt accumulation. There are no delicate levers, springs and valves exposed to the dust and dampness of the atmosphere. The thermostat has its air valves in a sealed compartment where nothing but filtered air can reach them. With our system there is no *constant waste* of air, the Powers thermostat being the only one that has a double valve, controlling both supply and waste and permitting no air to escape until its work has been accomplished. This makes it the most economical thermostat on the market, using about one-tenth of the air required by other systems.

If any architects or engineers are prejudiced against automatic regulation in its application to large office and apartment buildings by reason of complicated and unreliable devices which may have heretofore come under their observation, we ask of them a careful investigation into the merits of our system, being confident that we have devices which, by reason of their simplicity and effectiveness, will meet with approval.

In former editions of this book it has been our custom to print a list of our installations. That list has grown so large that it would require a book by itself, and is growing so rapidly that such a book would be ancient history by the time it came from the press.

We show in the following pages some representative buildings; as many as our space will allow. They are all equipped with the Powers System of Temperature Regulation. We have endeavored to select those buildings which have some degree of prominence and are therefore worthy of note. If the reader would like to know more of our work, we can usually refer him to examples of it in his own city.

The Powers Regulator Company



Minnesota State Capitol, St. Paul, Minn.
Cass Gilbert, Architect



Summit County Jail, Akron, O.
F. O. Weary, Architect



Swift & Co., General Offices, Union Stock Yards, Chicago
H. C. Gardner, Architect



Library, University of Illinois, Urbana, Ill.
Ricker & White, Architects



Northwestern Territorial Normal School, Alva, O. T.
J. Foucart, Architect



National Bank of St. Joseph, St. Joseph, Mo.
Jenney & Mundie, Architects



Bradley Polytechnic Institute, Peoria, Ill.
Henry Ives Cobb, Architect



High School, Mason City, Iowa
Patton & Miller, Architects



High School, Goshen, Ind.
Patton & Miller, Architects



U. S. Government Building, Omaha, Neb.



Lutheran Hospital, La Crosse, Wis.
Hugo Schick, Architect



U. S. Government Bureau of Standards, Washington, D. C.



Central High School, Detroit, Mich.
Malcolmson & Higginbotham, Architects



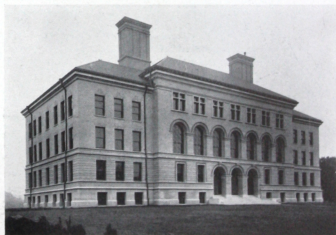
Central School, Grand Haven, Mich.
Williamson & Grow, Architects



High School, Manchester, N. H.
William M. Butterfield, Architect



High School, New Haven, Conn.
Brown & Von Beren, Architects



State Normal School, Lowell, Mass.
Stickney & Austin, Architects



Morris High School, New York City
C. B. J. Snyder, Architect



Dominion Bank, Montreal, P. Q., Canada
Finley & Spence, Architects



Onondaga County Savings Bank, Syracuse, N. Y.
E. W. Gibson, Architect



High School, Kankakee, Ill.
Chandler & Park, Architects



Chestnut Street School, Springfield, Mass.
E. C. & G. C. Gardner, Architects



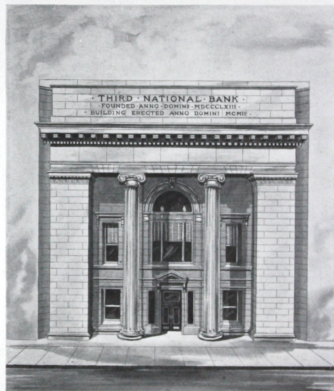
State Normal School, Macomb, Ill.
Watson & Hazleton, Architects



St. Mary's Parochial School, Toledo, Ohio
Bacon & Huber, Architects



Bank of Nova Scotia, Toronto, Ont.
Darling & Pierson, Architects



Third National Bank, Cincinnati, Ohio
D. H. Burnham & Co., Architects



City Prison, New York City
Horgan & Slattery and Withers & Dixon, Architects



Lucas County Court House, Toledo, Ohio
David L. Stine, Architect



State Normal School, Trenton, N. J.



Miller School, Akron, Ohio
F. O. Weary, Architect



East Toledo Central High School, Toledo, Ohio
G. S. Mills, Architect



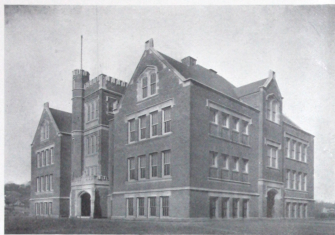
Washington School, Evanston, Ill.
Patton, Fisher & Miller, Architects



Studebaker Theater, Chicago, Ill.
S. S. Beman, Architect



Chicago National Bank, Chicago, Ill.
Jenney & Mundie, Architects



Lane School, Akron, Ohio
F. O. Weary, Architect



Criminal Court Building, New York City
Thom & Wilson, Architects



Lincoln School, Evanston, Ill.
John T. W. Jennings, Architect



Law School, University of Pennsylvania, Philadelphia, Pa.
Cope & Stewardson, Architects



U. S. Post Office, Washington, D. C.



Engineering Hall, Iowa State College, Ames, Iowa
Proudfoot & Bird, Architects

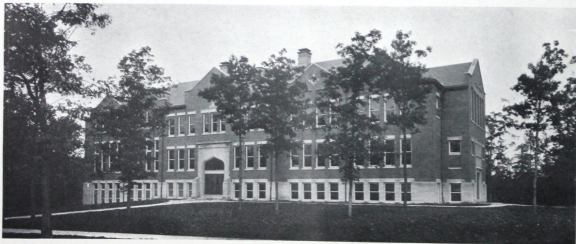


Union Club, New York City
Cass Gilbert and John Du Pais, Architects

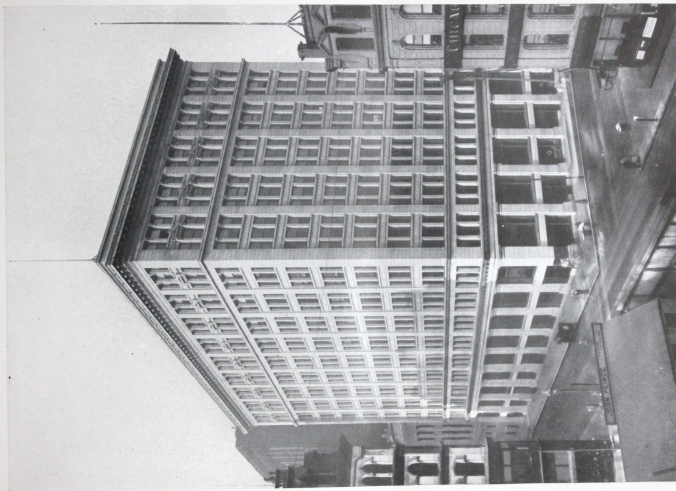


Mallers Apartment Building, Chicago
Harvey Wright, Architect

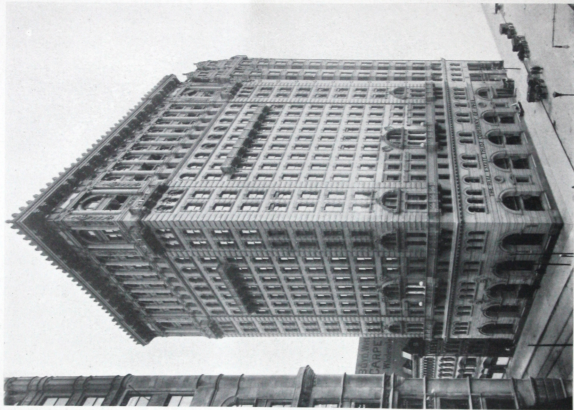
Psychopathic
Ward Hospital
University of Michigan
Ann Arbor, Mich.
Albert Kahn, Architect



High School
Highland Park, Ill.
J. C. Llewellyn, Architect



Merchants Loan & Trust Building, Chicago
D. H. Burnham & Co., Architects



Real Estate Trust Building, Philadelphia
Edgar S. V. Siler and F. C. Roberts & Co., Architects and Engineers
Heated by Indirect Fan System — 750 Thermostats

BUYING
HEAT
REGULATION

IN buying heat regulation you are purchasing an apparatus that, like any other mechanical device, will in the years to come, require attention or repairs which can best be furnished by the original manufacturers. There are many so-called heat regulating appliances in disuse today, not only by reason of their original imperfections, but because the promoters of them have disappeared,—out of business. There are constantly springing up new concerns that make extravagant claims for new and untried apparatus. It is well to consider seriously whether such firms are sufficiently established to make it certain that they will be here in five or ten or fifteen years from now to repair or give attention to their apparatus, even supposing it to have a part of the merit claimed. The business of heat regulation has been one of growth, constant study and improvement.

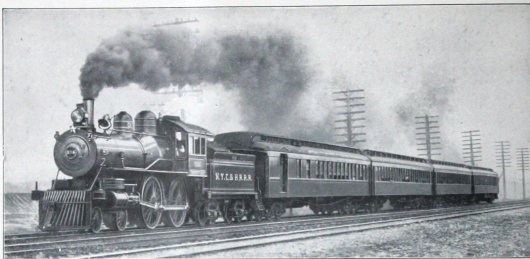
The Powers Regulator Company has been in the business of manufacturing temperature controlling apparatus for the past fifteen years and has today a large and well equipped factory with an output of thousands of thermostats per year, a large organization of competent mechanics and construction men traveling over all parts of this country, a corps of inspectors whose business it is to inspect and put in operation new plants and attend to the older ones when necessary, so that any client of ours may be certain of receiving prompt and expert service should he require it.

Thousands of dollars have been expended by us in the improvement of our appliances with the object of making them more effective and, more particularly, *permanent*, with the result that we now present for your consideration temperature controlling apparatus that has by years of trial proven thoroughly effective and high class in the extreme.

In the control of hot blast or fan systems of heating we are acknowledged leaders, and our apparatus has no equal.

New York
Chicago
Philadelphia

The Powers Regulator Company



Empire State Express, New York Central & Hudson River Railroad
Equipped with Powers Regulation

Railway Car Temperature

The Powers System of Automatic Temperature Control is being installed in railway cars, both coaches and sleepers, whether heated by steam from the engine or by coal-burning heaters. The apparatus is so simple in construction and so durable as to admit of effective work in this field where other appliances have failed by reason of their inability to stand rough usage. We have a special catalogue showing the application of our appliances to railway work. This will be sent upon request.

The progressive roads of the country are using the Powers System of Heat Regulation in their best trains.



